PELTI RF05 and RF06 Flight Report for 16 July, 2000

The objective of this flight was to vary the parameters that control the LTI's performance to see how the efficiency varies with these things. We intended to use dry dust as the test aerosol (haziness and AVHRR indicated moderate dust), but on our sounding found that all the dust was confined to the MBL. We made the LTI {isokinetic/superisokinetic/ subisokinetic}, {turbulent/laminar}, and varied the suction percentage that controls both enhancement and bend losses in the same way we did with sea salt in RF03. At the end of each APS period the turbulence profile was measured by moving the probe into the flow.

We also arranged to fly horizontal legs at 6 altitudes near the PRIDE experiment's lidar site on Cabras Island, Roosevelt Roads, Puerto Rico. We then stopped at Rosie Roads to visit the PRIDE sites and show them our package of equipment. The sort return flight to STX (on which we did our common-inlet calibrations) was numbered separately as RF06.

1518	Takeoff for RF05
1522 – 1529:36	Sounding up to 2400 m (ENE)
	FSSP concentrations dropped steadily: Dust mostly below 4000'
	Mixed layer about 600 m
1529:36 - 1538	Level at 2400 m for LTI flow/pressure-drop test
1538 - 1543	Descent to 300 m and turn to the East

Isokinetic LTI with various target sample flow rates

1559	35 lpm – Minimum bend velocity, **Laminar**
1558:18 – 1613:27?	APS Runs
1613	Turn to West, still at 300 m
1615:45 – 1644:20	120 lpm – **Barely laminar**, Max bend velocity
1621:24 – 1644:20	APS Runs
	Filters exposed, Nuclepore in TAS
	Turn to East, still at 300 m
1653:20 – 1721:35	200 lpm –**Turbulent**
1659:48 – 1720?	APS Runs
	Filters exposed, Nuclepore in TAS
	Turn to West, still at 300 m

Subisokinetic LTI – ~50% below isokinetic

1739 - 1741	120 lpm – Barely laminar
1730:18 – 1741?	APS Runs

Superisokinetic LTI - ~13% above isokinetic

1743:30 - 1758	120 lpm – Barely laminar
1747:445 – 1752:50	APS Runs
	Fly towards Roosevelt Roads, PR

Lidar Profile

Six 40 mile NE/SW Legs, 1/2 Mile off Cabras Island, Rosey Roads

1814:56 – 1824:30	**300 m** MSL, nearest lidar at 1819:28
1815:14	APS start
1827:38 – 1838:46	**30 m** MSL, nearest lidar at 1833
1841:47 – 1851:50	**150 m** MSL
1854:56 – 1907:00	**300 m** MSL
1911:05 – 1919:20	**900 m** MSL
1912:18	Stopped APS average briefly due to cloud encounter
1922:00 – 1930	**1800 m** MSL
1924:12	APS start. May be only one 5 minute average
1931:40	Descent to Land at Rosey Roads, PR **End of RF05**
2000 – 2200	Equipment tours with PRIDE at Hangar 200 Jeff Reid showed us the Navajo, set up primarily for radiation obs Hal Maring toured us through the Cabras Island in situ and lidar site
2206	Takeoff for Return to STX, **Start of RF06**
2211:30	At 2300 m MSL
2225 – 2230	Common-inlet Calibration of APSs and Nephs
2035	Landed STX

Notes

- The DU LTI sample flow readings are again erratic. John Mullen believes he can fix this bug with reprogramming Tuesday AM.
- We dodged rain shafts frequently at 300 m, so there are numerous small turns in those legs. Lynn Russell worked with the pilots to vector near the rain but not in it to look for small particle Na.
- A new approach to sealing the exit flow from the cabin FSSP seems to have reduced leakage.
- The FSSPs again showed very little Wing/Cabin difference when the LTI was turbulent, but apparent enhancement of the largest particles when laminar.
- The APSs again showed that the LTI produces only modestly higher large particle concentrations than the other inlets when turbulent, but much higher concentrations when laminar.
- The nephelometers didn't agree very well in the common-inlet cal, and will need to be recalibrated before the next flight.

Commentary

Although we weren't able to test the LTI parameters in dry air as we had intended due to the low altitude of the dust, we have now done a pretty complete test of the factors that should control the inlet's performance. (We may try getting much more superisokinetic in a later flight, however.) The LTI performs very consistently relative to the other inlets, with higher concentrations of larger particles. What we need to look for now in the last two flights from STX is variable dust concentrations (to see if we can identify size differences in different layers) and variable sea salt sizes with altitude above the ocean. A very deep (up to 250 mb) dust storm is

predicted for 20-21 July, so we should have an opportunity to look for different dust distributions.

-Barry Huebert
17 July, 2000